

An anatomical illustration of the human circulatory system. A semi-transparent human torso is shown, revealing the heart and the network of arteries and veins. The heart is centrally located, with red arteries branching out to the left and right sides of the body, and blue veins returning blood to the heart. The background is a deep red, filled with numerous red blood cells of varying sizes, some in sharp focus and others blurred, creating a sense of depth and movement. The overall color palette is dominated by reds and blues, emphasizing the blood and the vascular system.

5.6 The Cardiac Cycle

SBI 3U



The Cardiac Cycle:

- Average adult heart rate is 60 to 100 beats per minute.
- At rest the heart can pump 5L in one minute, with exercise the heart can pump a max output of 25L/min.
- One cycle of contraction and relaxation take ~ 0.8 sec.
- The cardiac cycle is usually divided into two basic phases:
 1. Diastole – period of relaxation and filling of the heart with blood
 2. Systole – period of contraction and emptying of the heart

Pronunciation

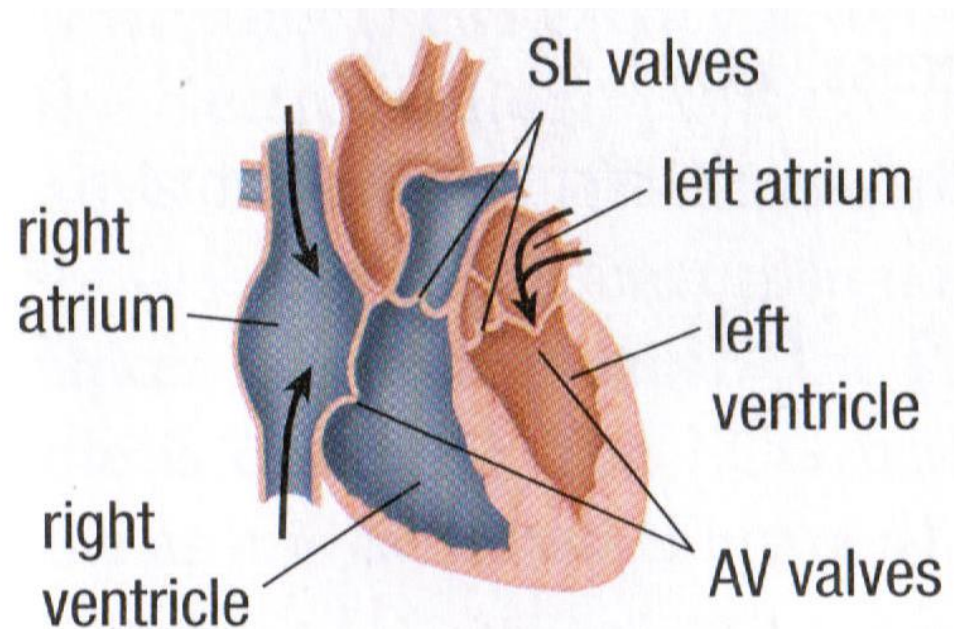
Diastole (die-as-tl-ee)

Systole (sis-tuh-lee)

The Cardiac Cycle:

Diastole – stage 1

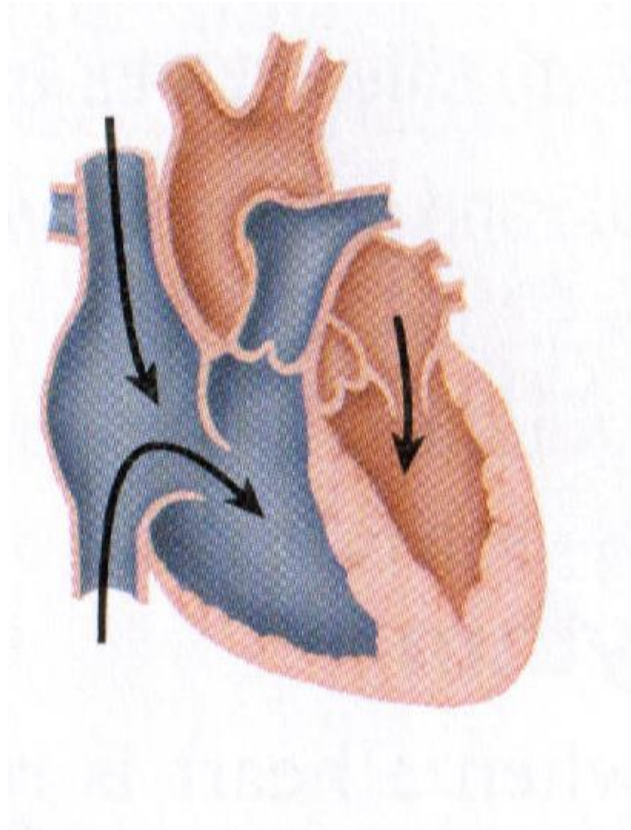
- Heart is fully relaxed
- atria begins to fill with blood
- Atrioventricular (AV) and semilunar (SL) valves are closed.



The Cardiac Cycle:

Diastole – stage 2

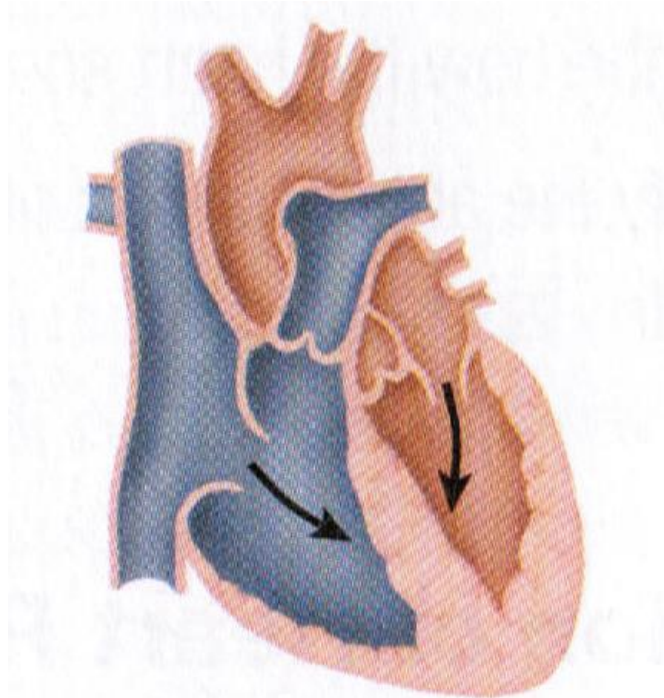
- Blood fills atria and pushes AV valve open
- Ventricle begin to fill



The Cardiac Cycle:

Diastole – stage 3

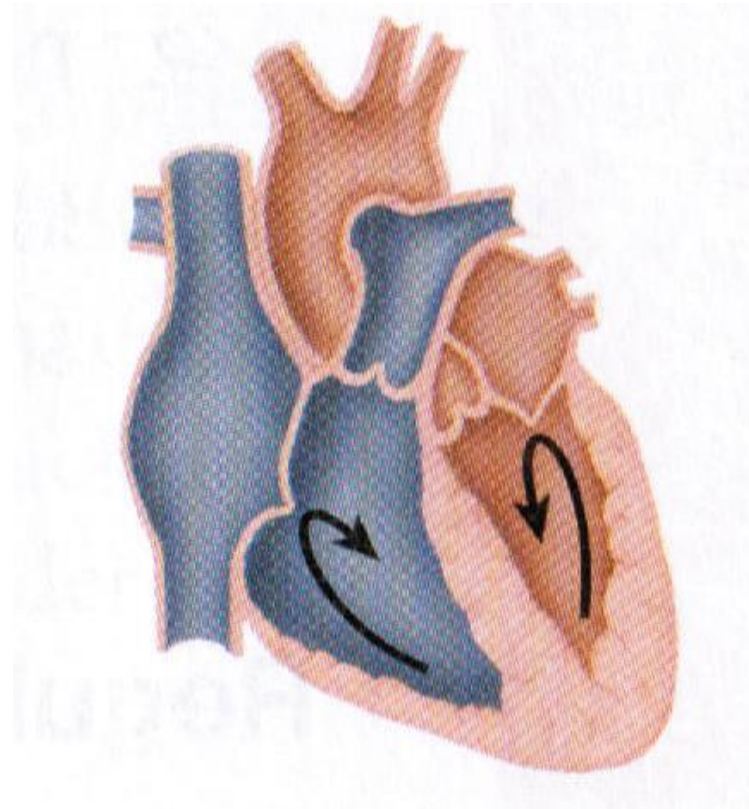
- Atria contract, filling ventricles completely



The Cardiac Cycle:

Systole— stage 4

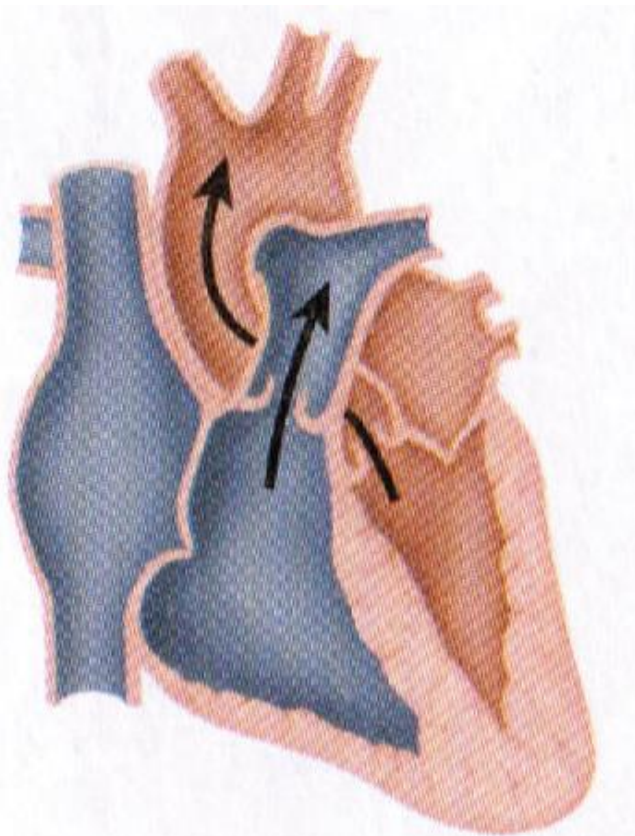
- Ventricles begin to contract, forcing AV valves closed
- SL valves remain closed



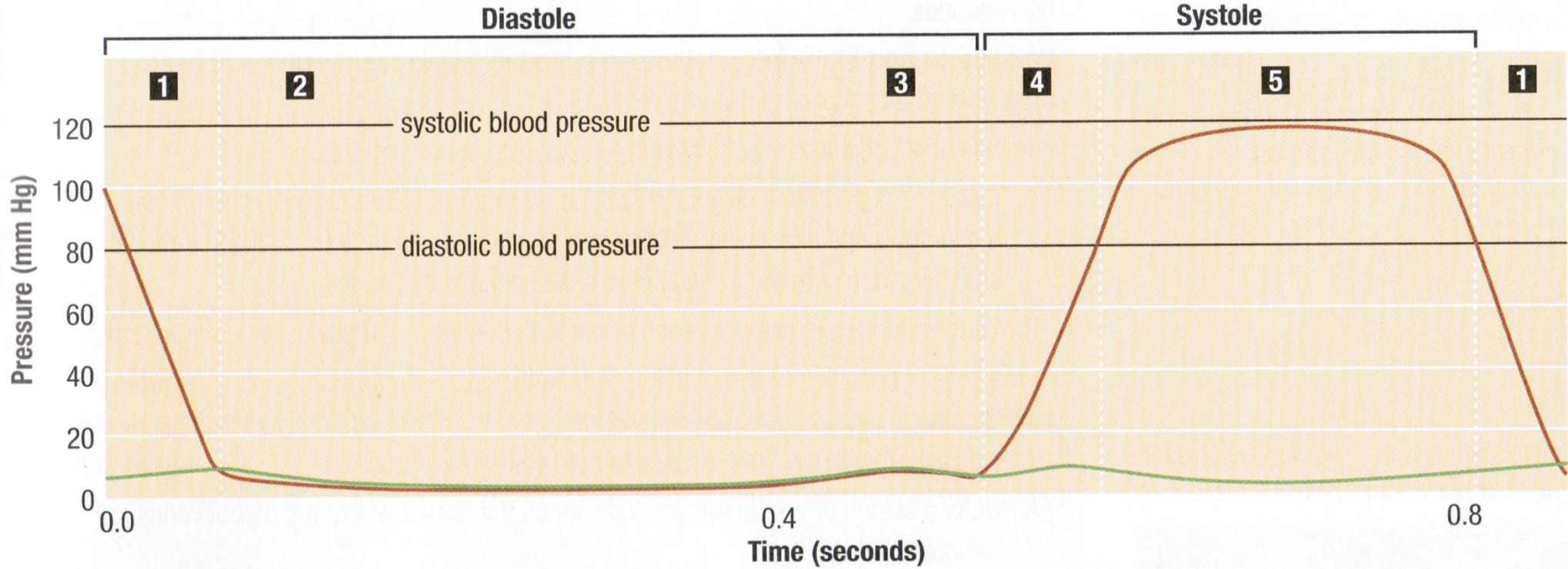
The Cardiac Cycle:

Systole— stage 5

- Ventricles contract fully, forcing the SL valves open and ejecting blood into arteries.



The Cardiac Cycle:



[Slide Show](#)

Heart's Tempo

Experiments have shown:

- When a heart is removed from a living animal, it continues to beat for a short time.
- Conclusion – heart muscle contraction must be within the muscle itself.

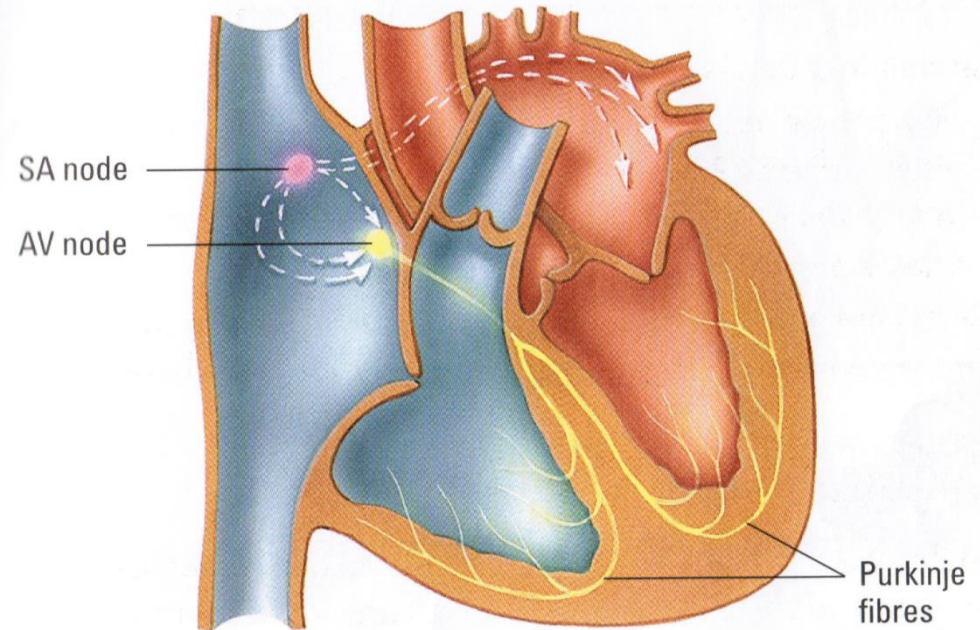
[Heart Removal Video](#)



Heart's Tempo

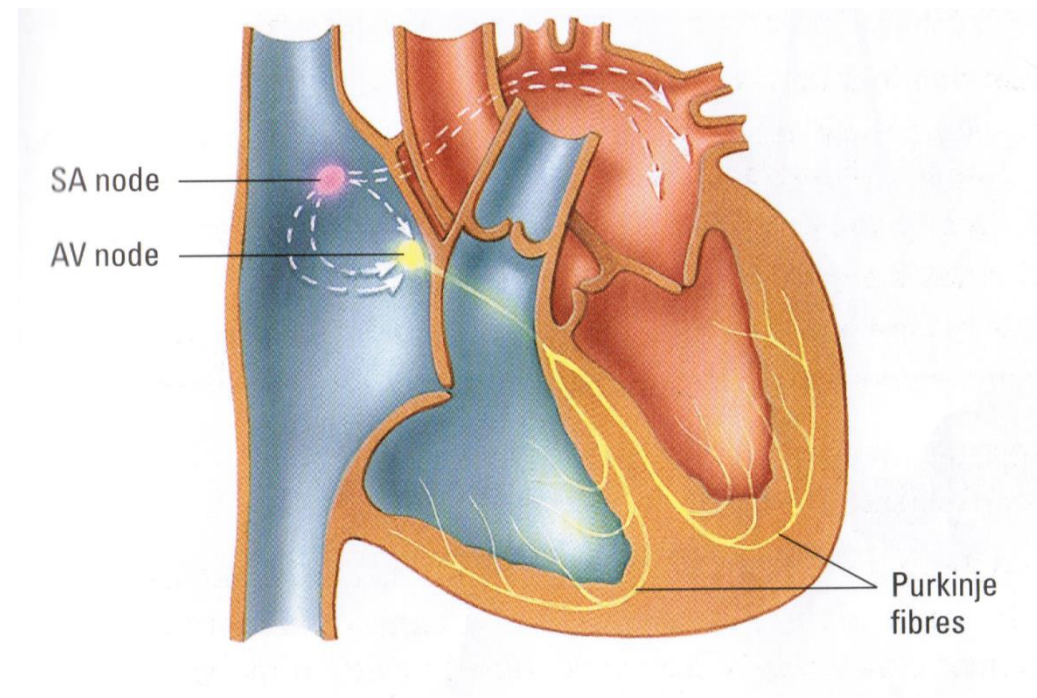
Heart muscles have the unusual ability to contract and relax on their own, without stimulation from an external source (nervous system).

- This type of muscle is known as **myogenic muscle**.
- Will keep beat even if the nervous system is damaged
- Heartbeat is initiated in a cluster of cells in the right atrium called the **sinoatrial (SA) node**.
- Acts as a pacemaker, and signals set the normal rhythm of the heartbeat.
- **SA** stimulates the contracts the atria



Heart's Tempo

- The atria contraction travels to the second node, the **atrioventricular (AV) node**.
- The AV node serves as a conductor, passing nerve impulses via two large nerve fibres called **Purkinje fibres**, through the septum towards the ventricles.
- A wave of cardiac contraction follows the nerve pathway.
- Both right and left atria contract prior to the contraction of the right and left ventricles



Factors Affecting Heart Rate

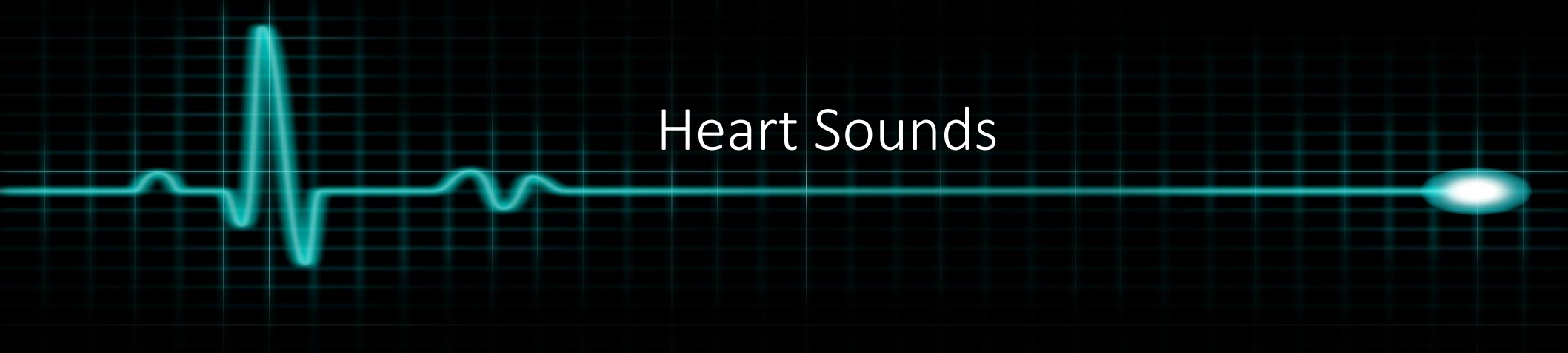
Your heart is also controlled by the sympathetic and parasympathetic nervous systems.

1. sympathetic nervous systems – “fight or flight” STRESS
2. parasympathetic nervous systems – “rest and digest” CONSERVES ENERGY

Other factors

- Emotional stress, physical stress (being overweight), physical activity, drugs (caffeine and nicotine) and various medical conditions.





Heart Sounds

The familiar ***lubb-dubb*** heart sounds are caused by the closing of the heart valves.

- The AV valve closing from pressure produces the ***lubb***.
- The closing of the semilunar valves creates the ***dubb*** sound.

[Heart beating animation](#)



Blood Pressure

Read p.264 to 266

Make notes on 7.8 Blood Pressure